

# Addressing Chronic Kidney Disease in People with Multiple Chronic Conditions

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National Kidney Disease Education Program



U.S. Department of Health  
and Human Services  
National Institute of Health

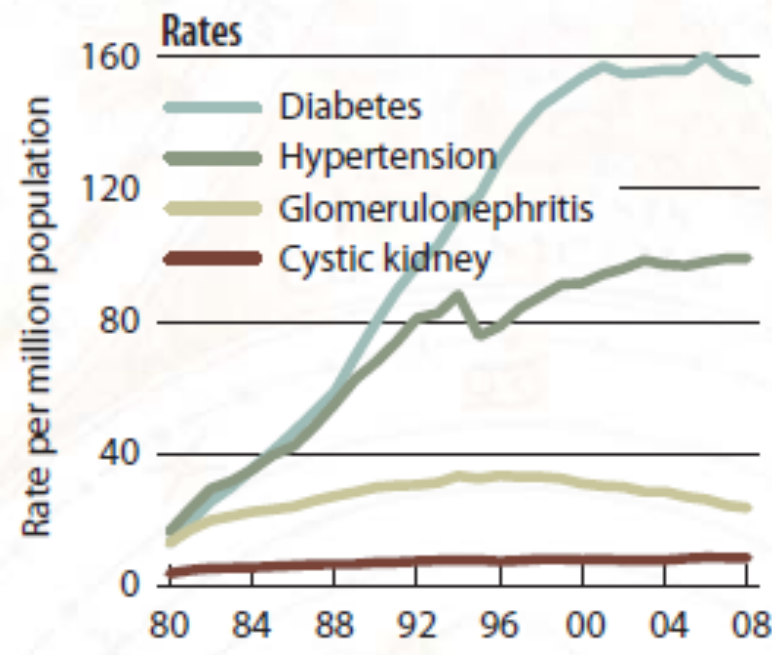
**NIDDK** | NATIONAL INSTITUTE OF  
DIABETES AND DIGESTIVE  
AND KIDNEY DISEASES

**NKDEP**  
National Kidney Disease  
Education Program

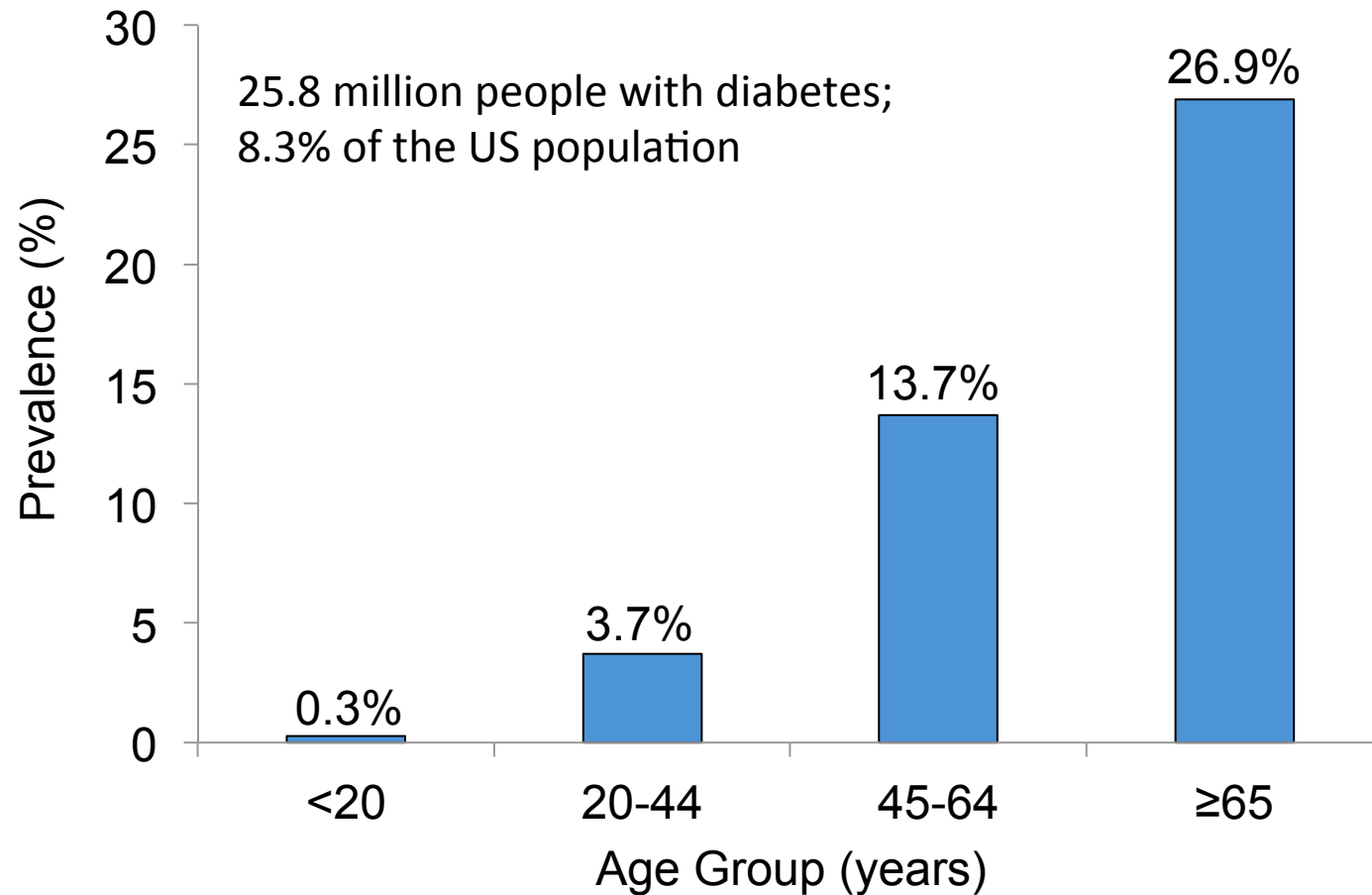
# Objectives

- **Demonstrate the link between obesity, diabetes, hypertension and CVD**
- Burden of kidney disease due to DM (DKD) in US
- Laboratory tests for identifying and monitoring DKD and assessing risk for progression
- Interventions to slow progression of DKD
- Population management strategies for improving outcomes for people with DKD

# Diabetes is the leading cause of ESRD, followed by hypertension



## Prevalence of Diabetes; United States, 2005-2008

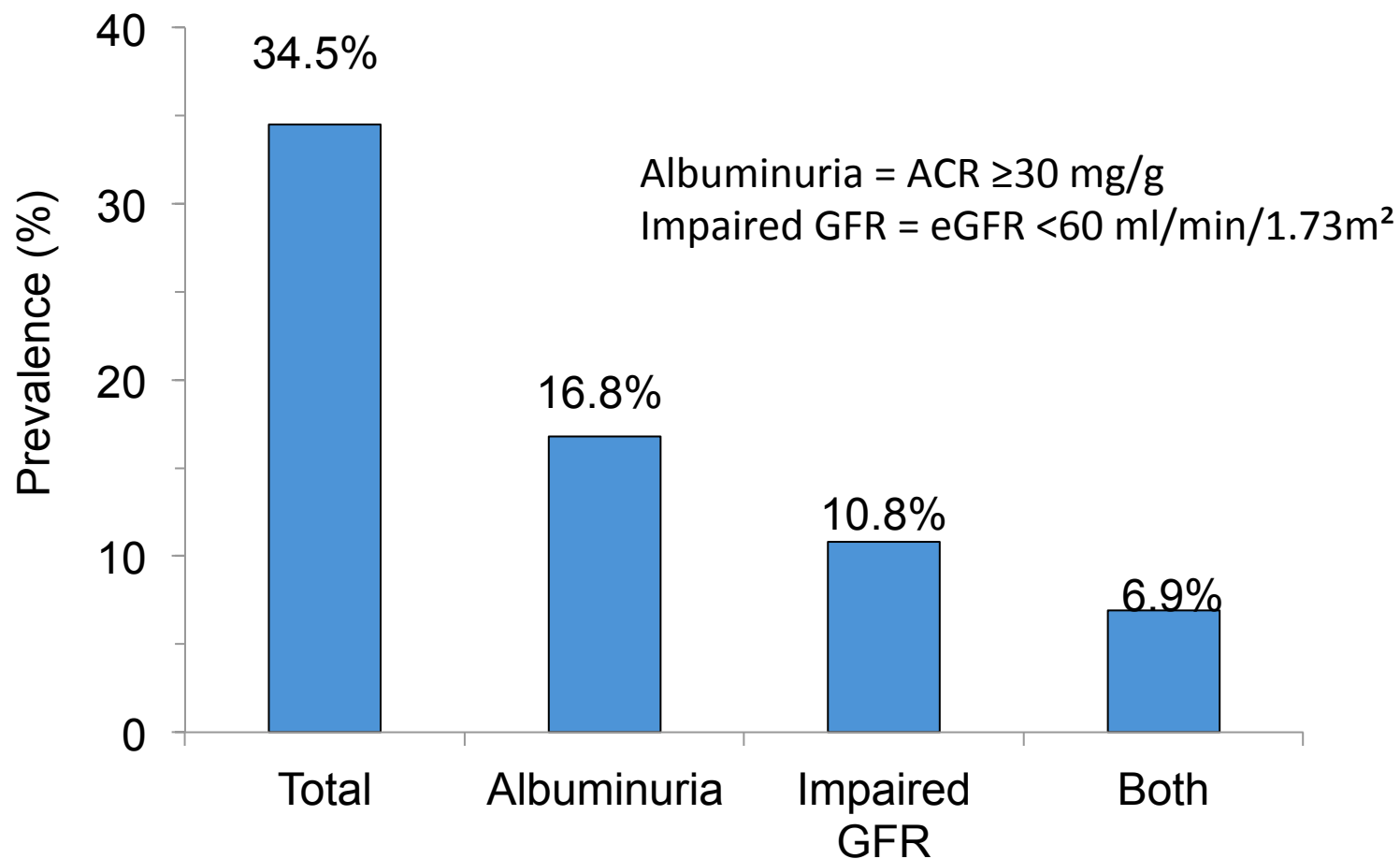




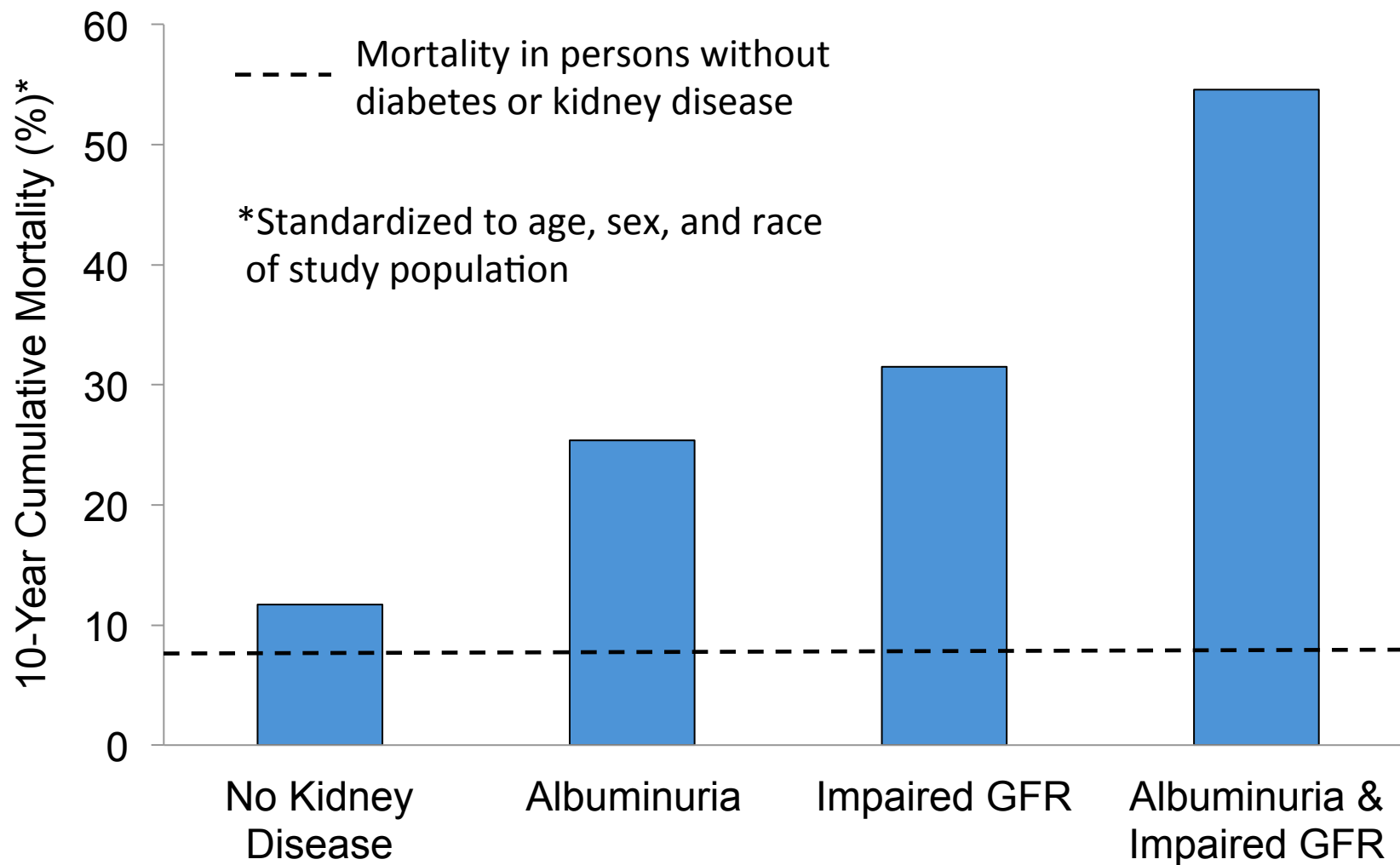
# CKD is reduced kidney function and/or kidney damage

- Chronic Kidney Disease
  - Kidney function
    - Glomerular filtration rate (GFR)  $< 60$  mL/min/1.73 m<sup>2</sup> for  $\geq$  3 months with or without kidney damage
  - AND/OR
  - Kidney damage
    - $\geq$  3 months, with or without decreased GFR, manifested by either
      - Pathological abnormalities
      - Markers of kidney damage, i.e., proteinuria (albuminuria)
        - » Urine albumin-to-creatinine ratio (UACR)  $> 30$  mg/g

# Prevalence of Diabetic Kidney Disease (DKD) Among Adults with Diabetes; United States, 2005-2008

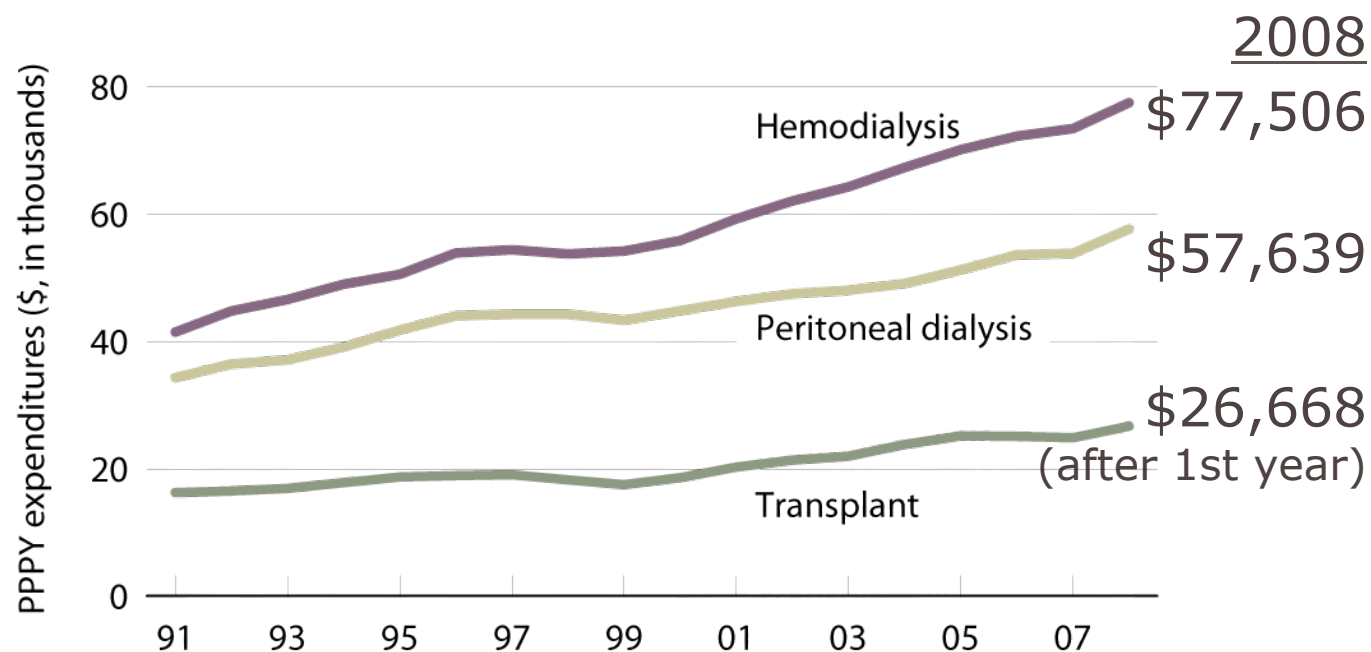


## 10-Year Mortality in Type 2 Diabetes in the United States



# Delaying the need for Renal Replacement Therapy (RRT) may be cost-effective.

Total Medicare ESRD expenditures, per person per year (PPPY)



Identify and Monitor CKD.

# **FUNCTIONAL ASSESSMENT**

# What is the glomerular filtration rate (GFR)?

- GFR is equal to the sum of the filtration rates in all of the *functioning* nephrons.
- GFR is not routinely measured in clinical settings.
- Estimation of the GFR (eGFR) gives a rough measure of the number of functioning nephrons.
- **eGFR estimates the measured GFR**
- eGFR is **not** the measured GFR.

Use urine albumin-to-creatinine ratio (UACR) to assess and monitor.

# KIDNEY DAMAGE

# Urine albumin is a marker for kidney damage

- Urine albumin measures albumin in the urine.
- An abnormal urine albumin level is a marker for glomerular disease, including diabetes.
- *Urine albumin is a marker for cardiovascular disease* and is a hypothesized marker of generalized endothelial dysfunction.



# Urine albumin results are used for screening, diagnosing, and treating DKD

- Standard of diabetes care (annual screen)
- Diagnosis
  - Forty percent of people are identified with CKD on the basis of urine albumin alone.
- Prognosis
  - Important prognostic marker, especially in diabetes mellitus (DM)
  - Used to monitor and guide therapy
- Tool for patient education and self-management (such as A1C or eGFR)

# Use urine albumin-to-creatinine ratio (UACR) for urine albumin assessment

- UACR uses a spot urine sample.
- In adults, ratio of urine albumin to creatinine correlates closely to total albumin excretion.
- Ratio is between two measured substances (not dipstick).

$$\frac{\text{Urine albumin (mg/dL)}}{\text{Urine creatinine (g/dL)}} = \text{UACR (mg/g)} \approx \text{Albumin excretion in mg/day}$$

- UACR of 30 mg/g is generally the most widely used cutoff for “normal.”

# UACR quantifies all levels of urine albumin

- UACR is a continuous variable.
- The term albuminuria describes all levels of urine albumin.
- The term microalbuminuria describes abnormal urine albumin levels *not* detected by dipstick test.
  - 30 mg/g – 300 mg/g
- The term macroalbuminuria describes urine albumin > 300 mg/g.

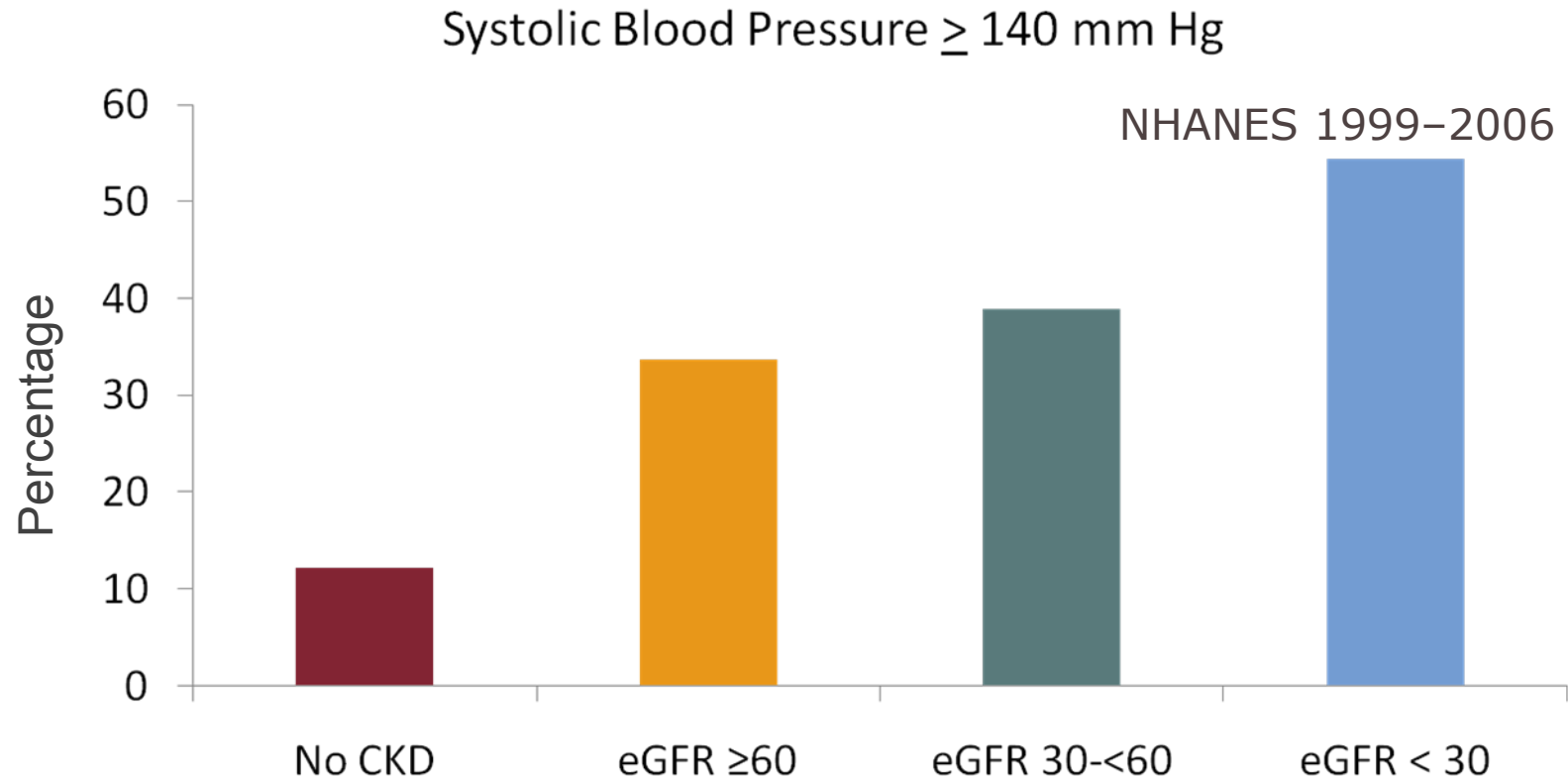
# Key Issues in Managing DKD

- Ensure the diagnosis is correct
- Monitor progression
- Implement appropriate therapy to slow progression
- Screen for CKD complications
- Educate the patient about CKD
- Prepare appropriately for kidney failure

# Therapy to Slow Progression

- Hypertension
- Diabetes
- Urine Albumin
- CVD Risk Factors

# Blood pressure is poorly controlled in people with CKD



Reference: Adapted from USRDS 2009 *Annual Data Report*

# Individualized blood pressure goals in CKD

- Target of < 140/90 mmHg endorsed by JNC 8.
- Uncontrolled hypertension (systolic blood pressure  $\geq$  160) is a major challenge.
- Issue of BP goal with elevated albuminuria unresolved.

# ACEi and ARBs are renoprotective

- Effects are beyond blood pressure control.
- Reduce protein in the urine.
- Sometimes these medications are prescribed to lower urine albumin levels in normotensive people.
- Small increase in creatinine may reflect efficacy



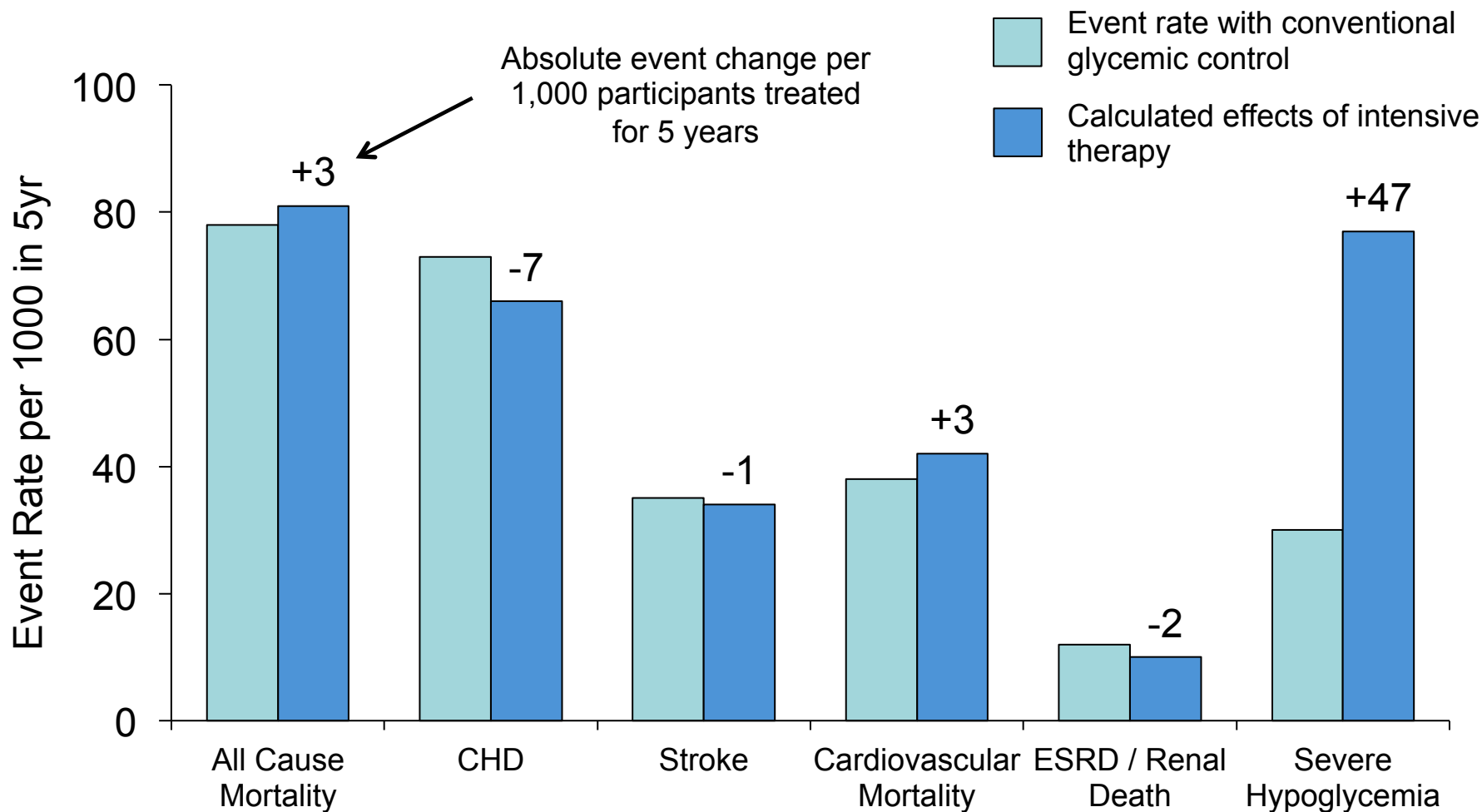
# Good glycemic control early may reduce CKD later

- There is evidence that control of newly diagnosed diabetes may help prevent CKD.
  - Type 1 diabetes (DM 1)
    - Diabetes Control and Complications Trial (DCCT)
  - Type 2 diabetes (DM 2)
    - United Kingdom Prospective Diabetes Study (UKPDS)

# UKPDS: Control of newly diagnosed type 2 DM may lower risk of albuminuria

- Newly diagnosed, first 10 years
  - Median age: 54 years (48–60 years)
- Intensive control defined as A1C < 7.0% (compared to 7.9%)
- 34% reduction in albuminuria
- Long-term data not as clear
- Good control of diabetes of long duration may not be as effective in slowing CKD

# 1000 Patients Treated Intensively for 5 Years Will Experience 47 Additional Hypoglycemic Events to Prevent 2 Cases of ESRD



# Treating Hyperglycemia in Patients with Chronic Kidney Disease

- Hyperglycemia harms kidneys.
- Intensive glycemic control increases the risk of severe hypoglycemia.
- Evidence that intensive glycemic control reduces the kidney complications of diabetes is based almost exclusively on prevention of micro- and macroalbuminuria.
- The benefits of intensive glycemic control must be balanced against the potential harm of this intervention.
- Hypoglycemia may be a sign that kidney disease has progressed

# A1C goal is individualized in CKD

- Goal for the general population
  - A1C < 7%
- Less stringent goal may be appropriate for:
  - Frequent severe hypoglycemia
  - Limited life expectancy
  - Advanced microvascular (CKD) or macrovascular complications

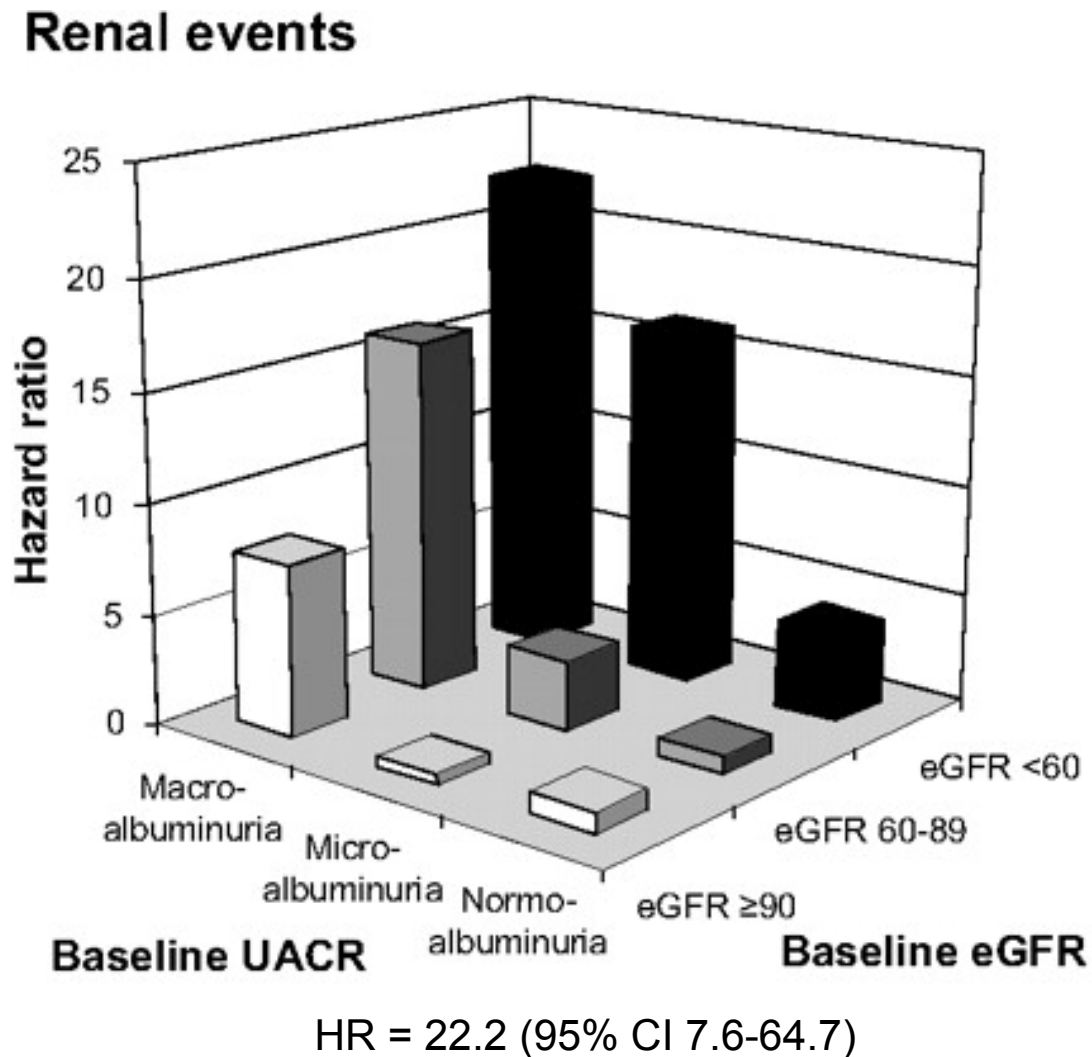
Reference: Diabetes Care, (suppl 1) 2011

# High protein diets are not recommended for DKD

- Dietary protein may increase GFR and renal blood flow rates. Animal protein may have greater effect than plant protein.
- Dietary protein is a source of nitrogen, phosphorus, potassium, and metabolic acids that need to be filtered and excreted by the kidneys.
- Animal protein intake may be a risk factor for increased urine albumin excretion in hypertension *and* diabetes.

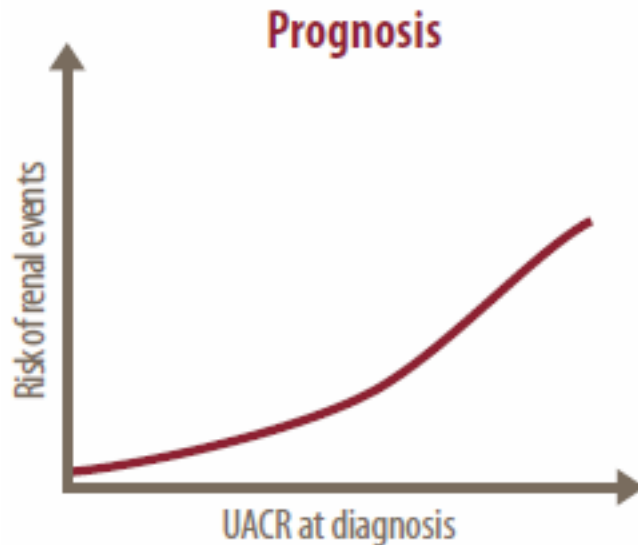
Reference: Friedman, 2004; Bernstein et al., 2007, Wrone et al., 2003

# Effect of DKD on the Risk of Renal Events in ADVANCE

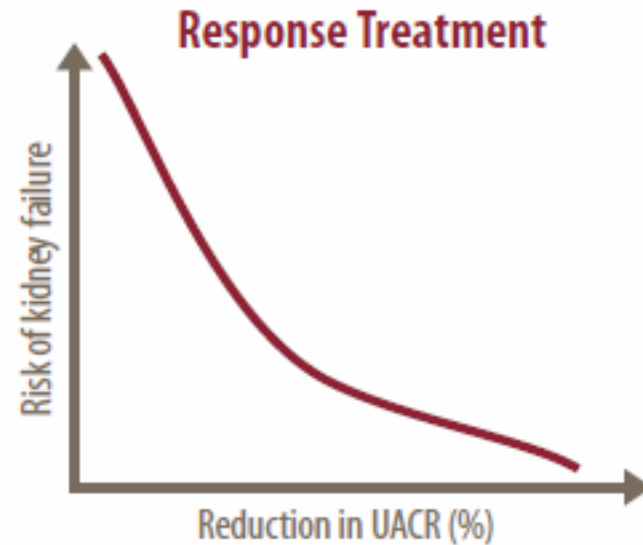


# Elevated UACR is associated with risk of renal events; lowering UACR may lower risk of progression

Chronic Renal Insufficiency Cohort Study



RENAAL



Renal events = loss of half of eGFR, dialysis, or death



# Interventions for reducing urine albumin

- Control blood pressure
- Reduce sodium intake
- Achieve good control of diabetes early; may help prevent albuminuria
- Reduce weight (if obese)
- Reduce protein intake, if excessive
- Achieve tobacco cessation

# Intentional weight loss is associated with decreased proteinuria

- Literature review showed weight loss was associated with decreased proteinuria.
  - Dietary restrictions
  - Exercise
  - Anti-obesity medications
  - Bariatric surgery
- No data to evaluate effect on CKD progression.

Reference: Afshinnia et al., 2010

# Reducing sodium intake may reduce urine albumin levels

- Higher sodium intake is associated with increased urine albumin excretion.
- In a 2006 literature review, increasing salt consumption was associated with worsening urine albumin.

Reference: Verhave et al., 2004; Jones-Jones-Burton et al., 2006

CVD is the leading cause of morbidity and mortality in people with CKD.

# **CARDIOVASCULAR DISEASE**

# CKD complications are nontraditional risk factors for CVD

## Traditional risk factors

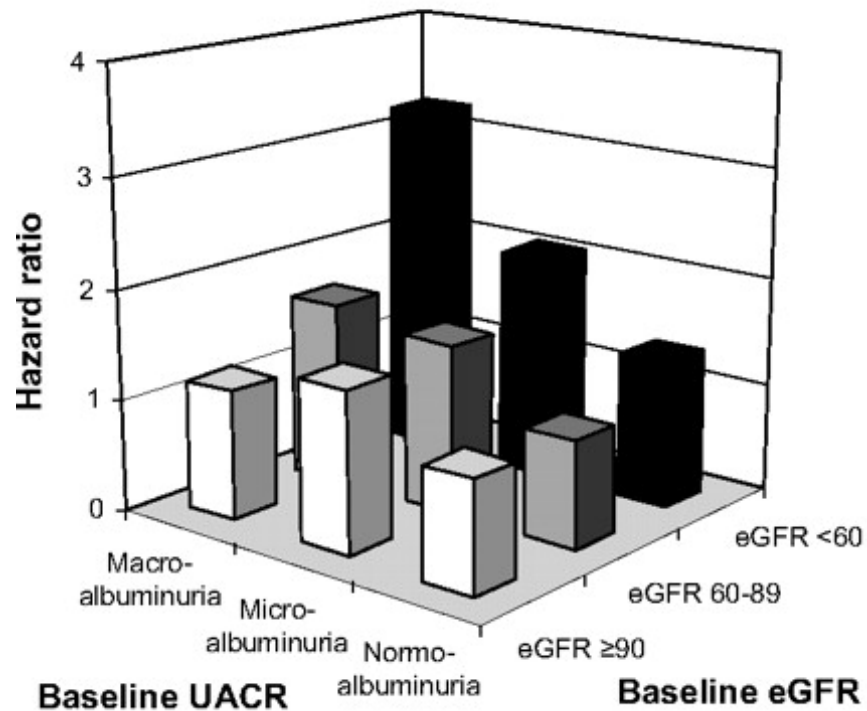
- Hypertension
- Diabetes
- Dyslipidemia
- Smoking
- Age
- Inflammation

## Nontraditional risk factors

- Albuminuria
- Anemia
- Abnormal metabolism of calcium and phosphorus

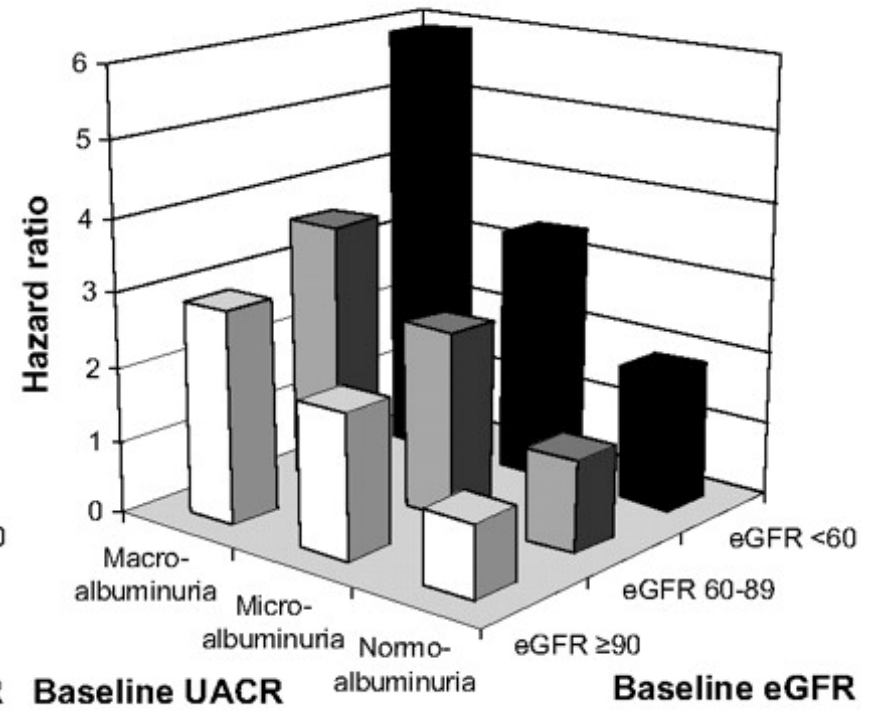
# Effect of DKD on the Risk of Cardiovascular Disease in ADVANCE

## Cardiovascular events



HR = 3.2 (95% CI 2.2-4.7)

## Cardiovascular death



HR = 5.9 (95% CI 3.5-10.2)

# Statins are used in patients with CKD

- Statins reduce hepatic cholesterol synthesis.
- Statins significantly reduce all-cause and CVD mortality in persons with CKD.
- Their use does not appear to slow CKD progression but may reduce proteinuria.
- Muscle toxicity or elevated liver function tests may be seen with statin use.

Reference: Navaneethan et al., 2009

# Challenges to Improving CKD Care

- CKD remains under diagnosed
- Implementation of recommended care is poor
- Many clinicians feel inadequately educated
  - Uncertain about how to interpret diagnostic tests
  - Unclear about clinical recommendations
  - Low confidence in their ability to successfully manage CKD
  - Indications for, and process of, referral poorly defined



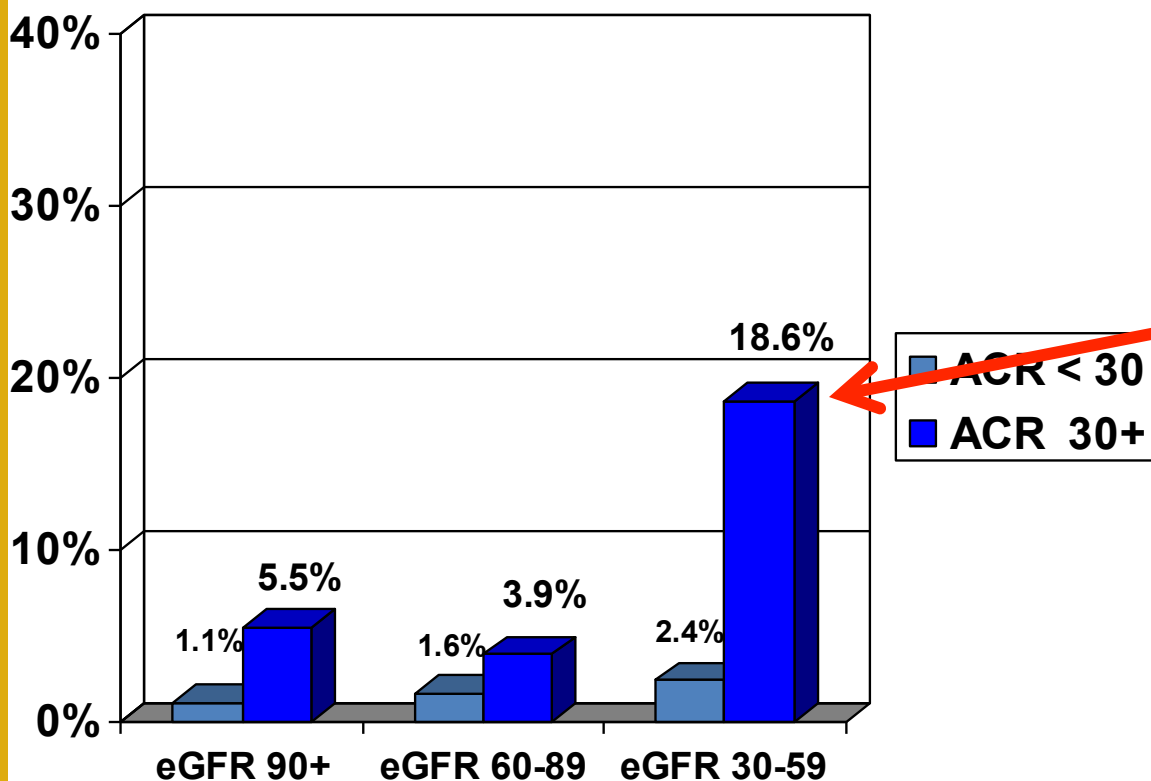
## ***Healthy People 2020: CKD objectives***

<b>Increase proportion of persons with CKD</b>	<b>Baseline</b>	<b>Target</b>
CKD 2: who know they have impaired renal function	7.3%	11.3%
CKD 4.1: who receive recommended medical evaluation with serum creatinine, lipids, and microalbuminuria	25.8%	28.4%
CKD 4.2: with type 1 or type 2 diabetes and CKD who receive recommended medical evaluation with serum creatinine, microalbuminuria, HbA1c, lipids, and eye exams	23.1%	25.4%
<b>Reduce proportion of persons with CKD</b>		
CKD 6.1: who have elevated blood pressure	74.1%	66.7%
CKD 6.2: who have elevated lipid levels	29.6%	26.6%

# Patient Awareness of CKD is Low

## General U.S. Population

*“Have you ever been told by a doctor or other health care professional that you had weak or failing kidneys?”*



NHANES 1999-2000:  
4101 participants

< 20% of patients with  
moderate to severe CKD  
said yes

Most had seen a  
physician within the past  
year

# Awareness & Knowledge about CKD in Patients Seen by Nephrologists

## Low Self-Rating Perceived Knowledge N=676

No Knowledge of Hemodialysis / Peritoneal Dialysis	43% / 57%
Little or No Knowledge Re: Diagnosis	35%

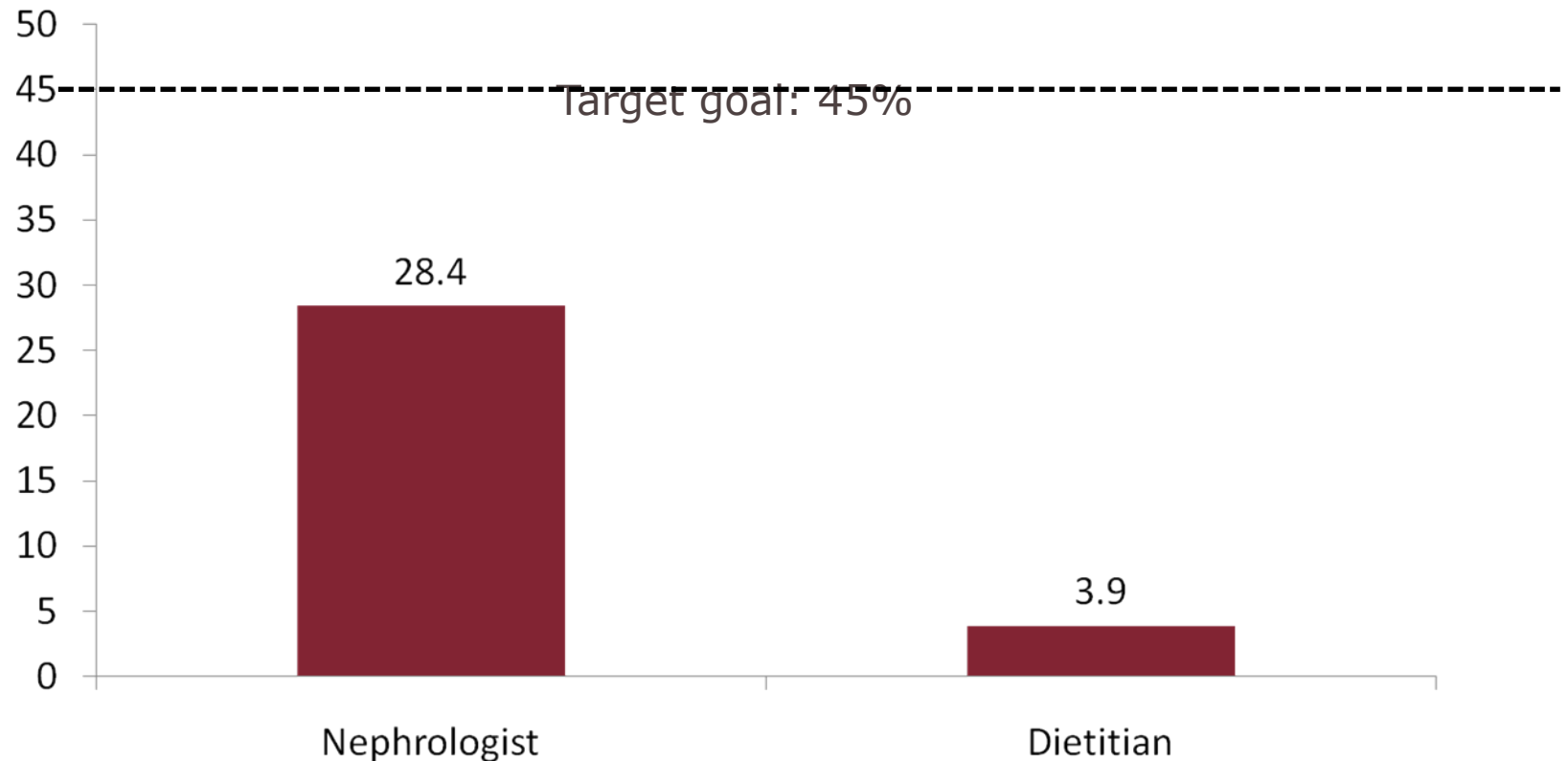
*Finkelstein, et al. Kidney International, 2008*

## Limited Awareness & Objective Knowledge N=401

Unaware of CKD diagnosis	31%
Do not understand CKD implications, e.g. heart disease	34%
Do not understand kidney functions, e.g. urine production	34%
Do not understand terminology, GFR	32%

**Healthy People 2010: Increase the proportion of treated chronic kidney failure patients who have received counseling on nutrition, treatment choices, and cardiovascular care 12 months before the start of renal replacement therapy.**

Pre-ESRD counseling and care for greater than 12 months (2008)



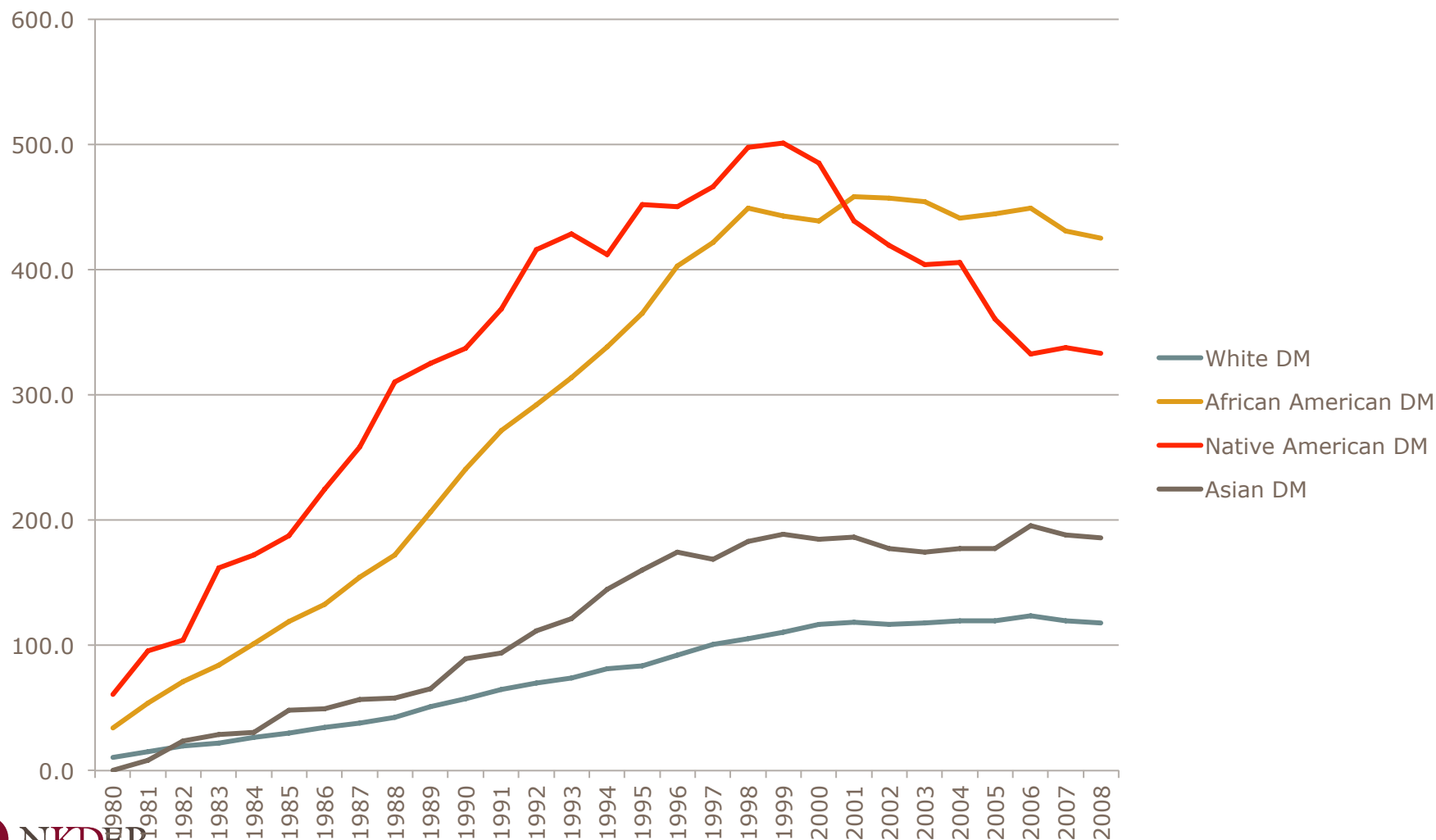
# What Can Primary Care Providers Do?

Addressing progressive kidney disease

- Recognize and test at-risk patients: monitor eGFR and UACR
- Screen for anemia (Hgb), malnutrition (albumin), metabolic bone disease (Ca, Phos., PTH)
- Treat cardiovascular risk, especially with smokers and hypercholesterolemia
- Refer to dietitian for nutritional guidance
- Educate patients about CKD and treatment

# Incident Rates of ESRD due to Diabetes 1980-2008

*per million population, by age, gender, race, & ethnicity*



# Lessons Learned

- CKD should be addressed as part of primary care
- Changing patterns of care requires changing “the system” (Chronic Care Model)
- Improvement in care results from changes implemented by physicians and non-physician health professionals
- Implemented through diabetes care delivery system; not specialty clinic based
- Emphasis on ensuring that patient received care from competent and interested individual, not referral
- Professional education designed to enable existing health care professionals to feel comfortable with kidney patients and deliver necessary care

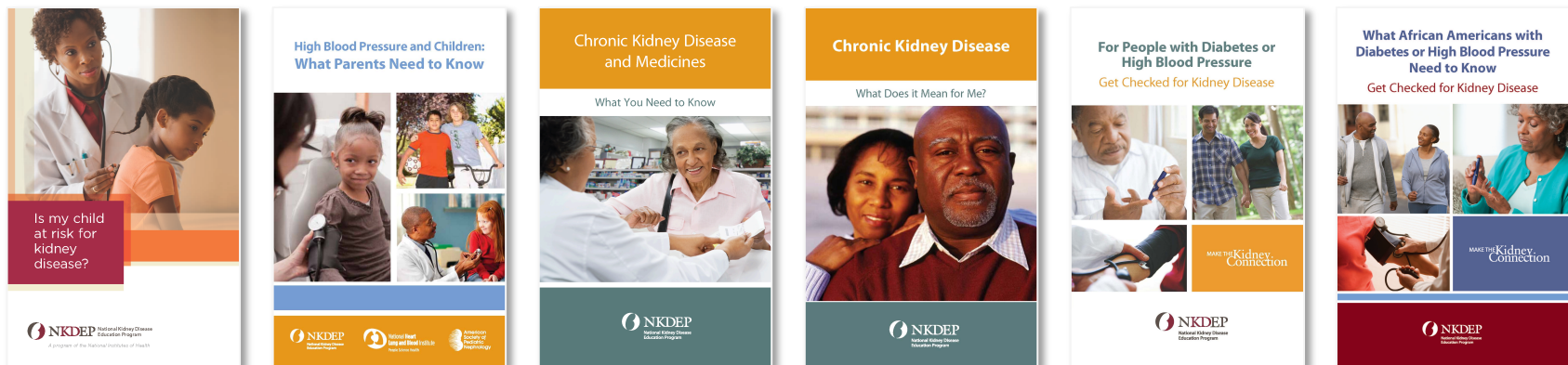
# The Chronic Care Model is the organizing principle of NKDEP



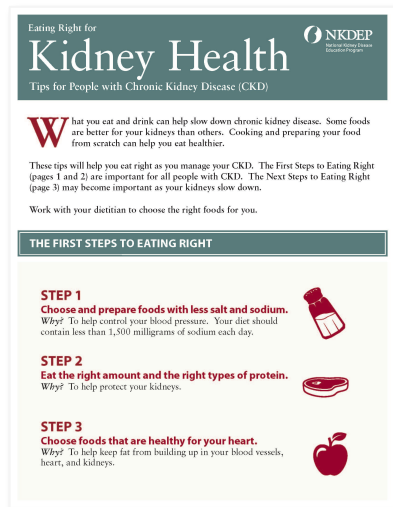
*The Chronic Care Model has been reprinted with permission from the American College of Physicians' Effective Clinical Practice. The original model was developed by the MacColl Center for Health Care Innovation. The Robert Wood Johnson Foundation funded refinement and testing of the model nationally across varied health care settings, creating the program, "Improving Chronic Illness Care." Copyright 1996-2013 The MacColl Center.*



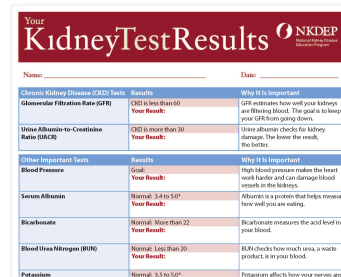
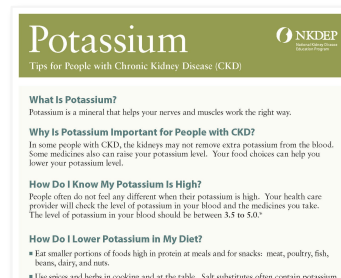
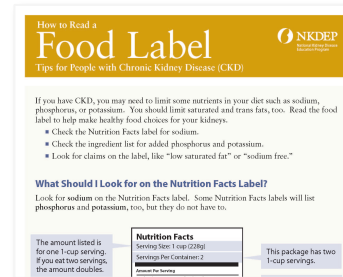
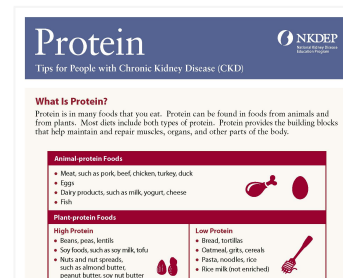
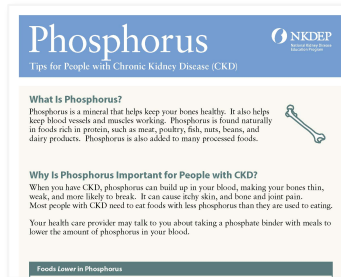
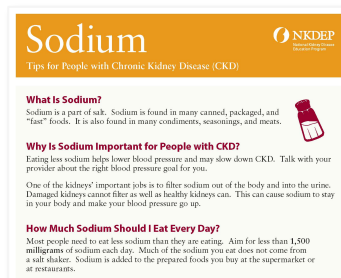
# How NKDEP Can Help You: Patient Education Resources



## Brochures



## Fact sheets



# How NKDEP Can Help You: Professional Resources & Clinical Tools

**How well are your kidneys working?**

**Explaining Your Kidney Test Results**

Your GFR result on \_\_\_\_\_ was \_\_\_\_\_.

□ A GFR of 60 or higher is in the normal range.  
 □ A GFR below 60 may mean kidney disease.  
 □ A GFR of 15 or lower may mean kidney failure.

**What is GFR?**  
 GFR stands for glomerular filtration rate. GFR is a measure of how well your kidneys filter blood.

Your urine albumin result on \_\_\_\_\_ was \_\_\_\_\_.

□ A urine albumin result below 30 is normal.  
 □ A urine albumin result above 30 may mean kidney disease.

**What is urine albumin?**  
 Albumin is a protein found in the blood. A healthy kidney does not let albumin pass into the urine. A damaged kidney lets some albumin pass into the urine. The less albumin in your urine, the better.

**Inside a healthy kidney**      **Inside a damaged kidney**

Your blood pressure result on \_\_\_\_\_ was \_\_\_\_\_.

Controlling your blood pressure may help to protect your kidneys.

Tear-off Pad

**Urine Albumin-to-Creatinine Ratio (UACR)**

**In Evaluating Patients with Diabetes for Kidney Disease**

The two key markers for chronic kidney disease (CKD) are urine albumin and estimated glomerular filtration rate (eGFR).  
 Assess urine albumin excretion yearly to diagnose and monitor kidney damage in patients with type 1 diabetes for five years or more or with type 2 diabetes.

- More frequent monitoring may be indicated in patients with changing clinical status or after therapeutic interventions.
- Use a spot urine albumin-to-creatinine ratio (UACR). UACR estimates 24-hour urine albumin excretion. Twenty-four hour collection and timed specimens are not necessary.

Urine albumin (mg/dL) ÷ Urine creatinine (g/dL) = UACR in mg/g = Albumin excretion in mg/day

UACR is a ratio between two measured substances. Unlike a dipstick test for albumin, UACR is unaffected by variation in urine concentration.

Albuminuria is present when UACR is greater than 30 mg/g and is a marker for CKD.

Albuminuria is used to diagnose and monitor kidney disease. Change in albuminuria may reflect response to therapy and risk for progression. A decrease in urine albumin may be associated with improved renal and cardiovascular outcomes.

**Prognosis**      **Response to Treatment**

In a large cohort of CKD patients, a higher UACR at time of diagnosis was associated with increased risk for renal events—loss of half of eGFR, dialysis, or death (Chronic Renal Insufficiency Cohort study).

A randomized trial of diabetic patients with CKD found that the greater the reduction of UACR in response to treatment with SGLT2, the lower the risk of progression to kidney failure. (De Zeeuw et al. & Kidney International 2016;330:259-270).

<sup>1</sup>Albuminuria is a term that describes all levels of urine albumin. Microalbuminuria is a term used to describe urine albumin levels not detected by a dipstick test, i.e., 30 mg/g–300 mg/g. Macroalbuminuria is sometimes used to describe albumin levels more than 300mg/g.

Quick Reference

**Nephrology Referral Form**

Save this form to your computer before entering data. Also, to comply with the Health Insurance Portability and Accountability Act of 2003, please protect the patient's health information and privacy in the contained form.

NAME \_\_\_\_\_ DATE OF BIRTH \_\_\_\_\_ FACILITY/PRACTICE AND RECORD NUMBER \_\_\_\_\_

REASON FOR REFERRAL \_\_\_\_\_

**FOR DIABETICS**

TYPE OF DIABETES \_\_\_\_\_ RECENT A1C \_\_\_\_\_ MONTH/YEAR \_\_\_\_\_

COMPLICATIONS: NEUROPATHY ☐ YES ☐ NO ☐ NOT PRESENT ☐ RETINOPATHY ☐ YES ☐ NO ☐ NOT PRESENT ☐ NEPHROPATHY ☐ YES ☐ NO ☐ NOT PRESENT

ALBUMINURIA: ☐ NOT PRESENT ☐ IF PRESENT, SINCE \_\_\_\_\_ MONTH/YEAR \_\_\_\_\_

HYPERLIPIDEMIA: ☐ YES ☐ NO ☐ IF PRESENT, SINCE \_\_\_\_\_ MONTH/YEAR \_\_\_\_\_

BLOOD PRESSURE: AT LAST TEST \_\_\_\_\_ VITAL RECORDS \_\_\_\_\_ FINAL YEAR OF DIAGNOSIS \_\_\_\_\_

ADDITIONAL EVALUATION: ANA \_\_\_\_\_ RF \_\_\_\_\_ CRP \_\_\_\_\_ ESR \_\_\_\_\_ OTHER \_\_\_\_\_

CHIEF HISTORY: KIDNEY DISEASE ☐ YES ☐ NO ☐ IF YES, HOW RELATED \_\_\_\_\_

OTHER CURRENT AND PREVIOUS MEDICATIONS \_\_\_\_\_

CURRENT MEDICATIONS (if any) \_\_\_\_\_

**ADDITIONAL INFORMATION**

DOES THE PATIENT UNDERSTAND THE NATURE OF HIS/HER DISEASE? ☐ YES ☐ NO ☐ DON'T KNOW

DOES THE PATIENT KNOW THE SEVERITY? ☐ YES ☐ NO ☐ DON'T KNOW

DOES THE PATIENT KNOW THAT HE/SHE MAY NEED SPECIAL? ☐ YES ☐ NO ☐ DON'T KNOW

ADDITIONAL INFORMATION \_\_\_\_\_

REVIEWED BY \_\_\_\_\_ DATE \_\_\_\_\_

REASON: \_\_\_\_\_

For more information about why these data are important to share with your local clinicians, see National Kidney Disease Education Program's [www.nkdep.nih.gov](http://www.nkdep.nih.gov)

Referral Forms

**CKD Diet Counseling (Medical Nutrition Therapy) Referral Form**

Save this form to your computer before entering data. Also, to comply with the Health Insurance Portability and Accountability Act of 2003, please protect the patient's health information and privacy in the contained form.

NAME \_\_\_\_\_ DATE OF BIRTH \_\_\_\_\_ MEDICAL RECORD # (if applicable) \_\_\_\_\_

REASON FOR REFERRAL: Medical Nutrition Therapy for chronic kidney disease. Goals: consult on dietitian \_\_\_\_\_

DIET DIABETIC CODE \_\_\_\_\_ OTHER DIABETIC CODES \_\_\_\_\_

BLOOD PRESSURE \_\_\_\_\_ WEIGHT \_\_\_\_\_ HEIGHT \_\_\_\_\_

RECENT WEIGHT CHANGE: ☐ NO ☐ YES ☐ NO ☐ YES ☐ NO ☐ YES

FOR DIABETICS: TYPE OF DIABETES \_\_\_\_\_ A1C \_\_\_\_\_ MONTH/YEAR \_\_\_\_\_

LABORATORY ASSESSMENT (document values)

ALBUMINURIA: ☐ YES ☐ NO ☐ IF PRESENT, SINCE \_\_\_\_\_ MONTH/YEAR \_\_\_\_\_

UACR (spot urine) (mg/g) (microalbumin) \_\_\_\_\_

CREATININE \_\_\_\_\_ eGFR (estimated) (mL/min/1.73m<sup>2</sup>) \_\_\_\_\_

ANEMIA: \_\_\_\_\_

HYPERLIPIDEMIA: \_\_\_\_\_

OTHER: \_\_\_\_\_

CURRENT MEDICATIONS (if any) \_\_\_\_\_

**ADDITIONAL INFORMATION**

DOES THE PATIENT UNDERSTAND THE NATURE OF HIS/HER DISEASE? ☐ YES ☐ NO ☐ DON'T KNOW

DOES THE PATIENT KNOW THE SEVERITY? ☐ YES ☐ NO ☐ DON'T KNOW

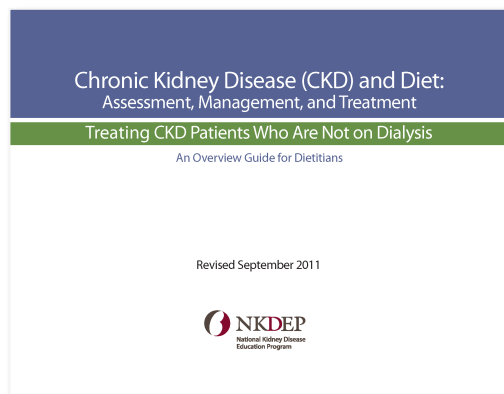
DOES THE PATIENT KNOW THAT HE/SHE MAY NEED SPECIAL? ☐ YES ☐ NO ☐ DON'T KNOW

ADDITIONAL INFORMATION \_\_\_\_\_

REVIEWED BY \_\_\_\_\_ DATE \_\_\_\_\_

REASON: \_\_\_\_\_

For more information about why these data are important to share with your local clinicians, see National Kidney Disease Education Program's [www.nkdep.nih.gov](http://www.nkdep.nih.gov)



RD Guide



Provider Modeling Videos

# How NKDEP Can Help You: Spanish-language Resources



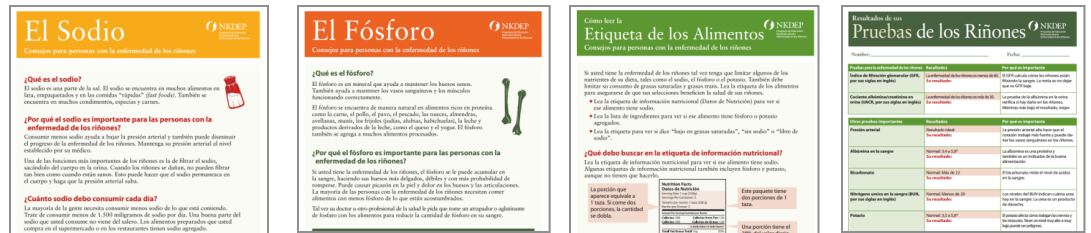
## Website



## 12 videos



## Brochures



## Fact sheets

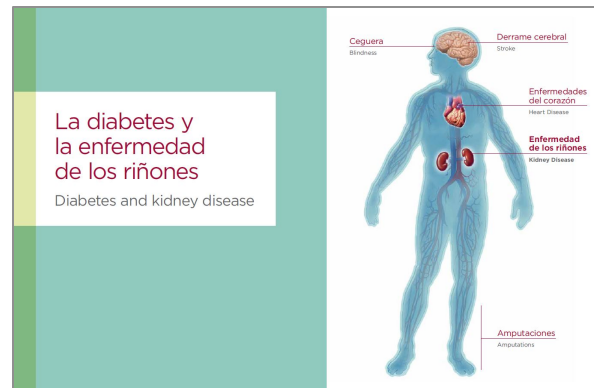
# How NKDEP Can Help You: Community Health Worker (Promotores) Materials



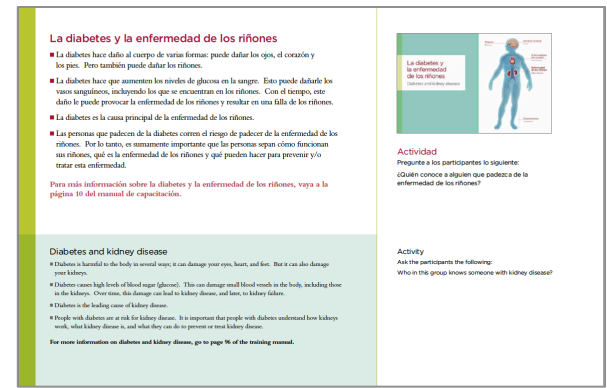
Training manual



Flipchart - cover



Flipchart – participant side



Flipchart – promotor side

# CKD Content on State Websites

- We conducted a content audit of state health department websites to answer the following questions:
  - How are state departments communicating kidney disease to their audiences?
  - What gaps in information are missing from health departments that could be provided by NKDEP?
  - Are materials being adapted culturally for a Spanish-language preferred audience?



# Findings

- **Four states** have either a dedicated kidney disease web page/section or comprehensive kidney disease information available online, including:
  - [Mississippi State Department of Health](#)
    - The Mississippi CKD Task Force is charged with developing a cost-effective plan for, and educating professionals on the early screening, diagnosis and treatment of chronic kidney disease
  - [Nebraska Department of Health & Human Services](#)
    - Links to National Diabetes Information Clearinghouse
  - [Virginia Department of Health](#)
    - Cites Family Reunion Initiative and links to NKDEP
  - [Texas Department of State Health Services](#)
    - Currently a NKDEP partner, met at FNCE, links to NKDEP
    - Working to rename themselves “TX Kidney Disease Education Program” and include NKDEP tagline on site

# Findings

- **17 states** currently mention kidney disease as a result of diabetes including Arizona, Kentucky, Maryland, and South Carolina.
- None of the five cities researched had kidney disease related information available online.
- No health departments had Spanish-language adapted information available on kidney disease or diabetes.

# How NKDEP Can Help You: **You Tell Us!**

We want to help you develop the resources you need to better prevent or manage kidney disease in your state.



# How YOU Can Help NKDEP:

- **Add a link to us from your website.** We want people in your state to know about our resources.
- **Tell us how we could improve our materials.** If you've used one of our tools and have an idea to make it better, let us know.

# Questions & Comments



[andrew.narva@nih.gov](mailto:andrew.narva@nih.gov)

<http://nkdep.nih.gov/>